

ROSAT X-ray Observations of the Primary and Secondary  
Streams of Interstellar Neutral Atoms

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Heavy neutral atoms entering the heliosphere from the interstellar wind are focused downstream of the Sun into a focusing cone, creating a region of enhanced neutral density. Solar wind high charge state ions charge exchange with these neutrals and, in the process, emit soft X-rays ( $\sim 0.25$  keV). In this presentation, we discuss ROSAT X-ray observations of both the primary and secondary streams of interstellar neutral atoms [Collier et al., Adv. Space Res., in press, 2003]. Results of the analysis indicate a value of  $\alpha$  consistent with about  $6 \times 10^{-16}$  eV cm<sup>2</sup> (e.g. Cravens, T.E., Ap. J., 532:L153, 2000, eq. 2), a heliospheric contribution to the total X-ray flux ranging from about 18% at about five-ten degrees off the downstream axis to about 40% directly above the downstream axis viewing southward, and a secondary stream entering the heliosphere from above the ecliptic plane which may contain 3-4 times more neutral density at 1 AU than the primary stream, at least during the time of the ROSAT All-Sky Survey. The origin, properties and implications of this secondary stream need to be examined before we can have any confidence that our understanding of the heliosphere is not flawed.